Paper birch

Betula papyrifera

The **volume of paper birch has decreased** significantly since 1983. This is a result of both natural succession and increased mortality. The numbers of seedlings and saplings have also decreased suggesting that paper birch will play a less prominent role in the future.

In the last 23 years, **growth rates have decreased** and are currently negative (mortality exceeds growth). Paper birch has the **highest ratio of mortality to growth** and the lowest ratio of growth to volume of all species in the state. Whereas paper birch makes up about 2.5% of all volume of trees in Wisconsin, it accounts for 10% of total mortality.

Paper birch roundwood production made up 6.3% of the statewide product in 2009. Because biomass of birch is decreasing so rapidly, it is not likely to be a major source of biofuel.

- *How has the paper birch resource changed?*
  Growing stock volume and diameter class distribution: 1983, 1996, and 2012
- *Where does paper birch grow in Wisconsin?*
  Growing stock volume by region with map
- *How fast is paper birch growing?*
  Average annual net growth by region and year: 1983, 1996, and 2012
- *How healthy is paper birch in Wisconsin?*
  Average annual mortality by region and year: 1983, 1996, and 2012
- *How much paper birch do we harvest?*
  Roundwood production by product: 1997, 2003, and 2009
- *How much is paper birch selling for?*
  Prices for cordwood and sawtimber: 2000 to present
- *How much paper birch biomass do we have?*
  Aboveground carbon by region of the state: 2012

"How has the paper birch resource changed?"

Growing stock volume and diameter class distribution by year

The growing stock volume of paper birch in 2012 (Chart 1) was about 540 million cft or about 2.5% of total statewide volume. This represents a decrease of 49% since 1983 and 36% since 1996.

Volume in growing stock trees is decreasing in all size classes (Chart 2). The number of trees is also decreasing dramatically (Chart 3). Pole-sized trees have decreased in number by 43% since 1996. Seedlings and saplings have decreased as well, suggesting that paper birch will play a less prominent role in the future.

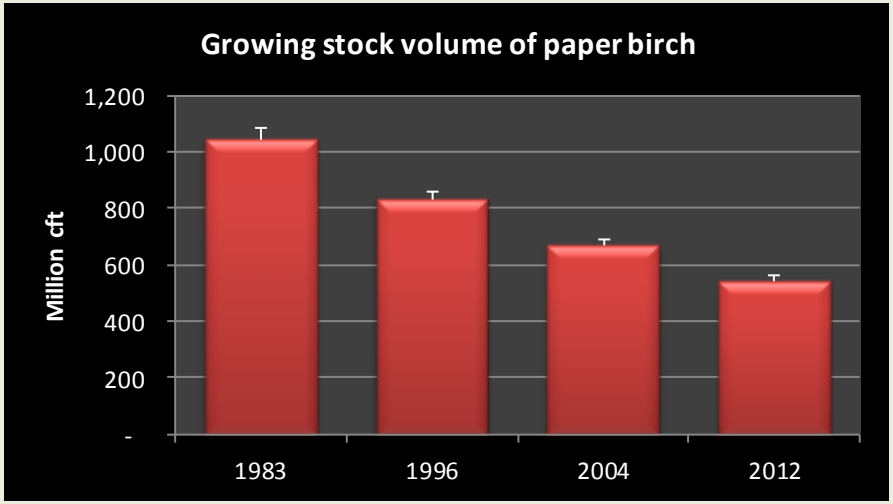


Chart 1. Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2012.

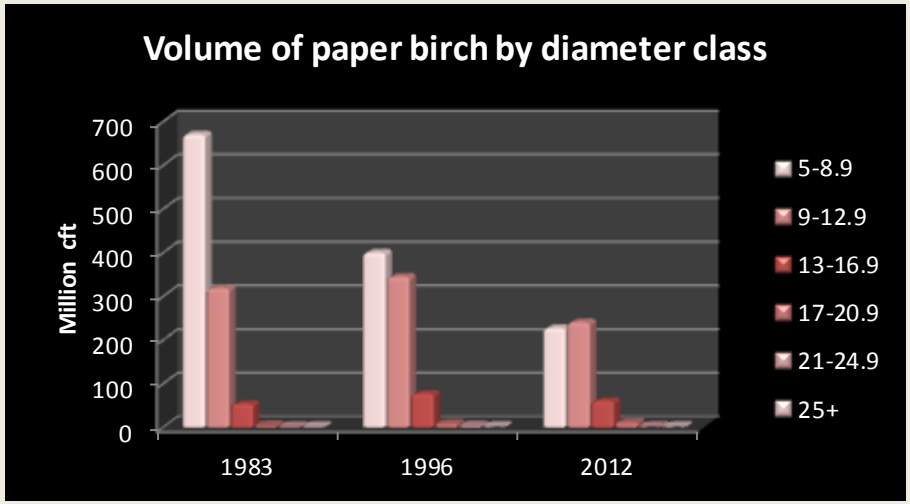


Chart 2. Growing stock volume (trees over 5 inches dbh) in million cubic feet in 1983, 1996, and 2012.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2012.

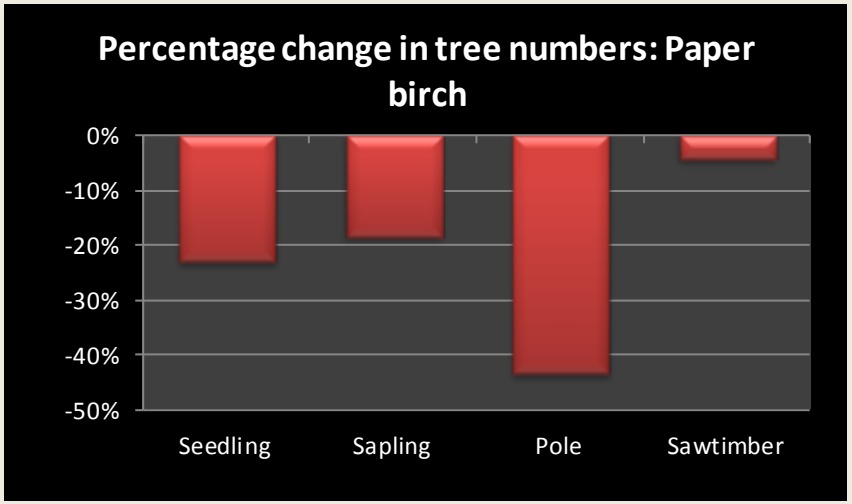
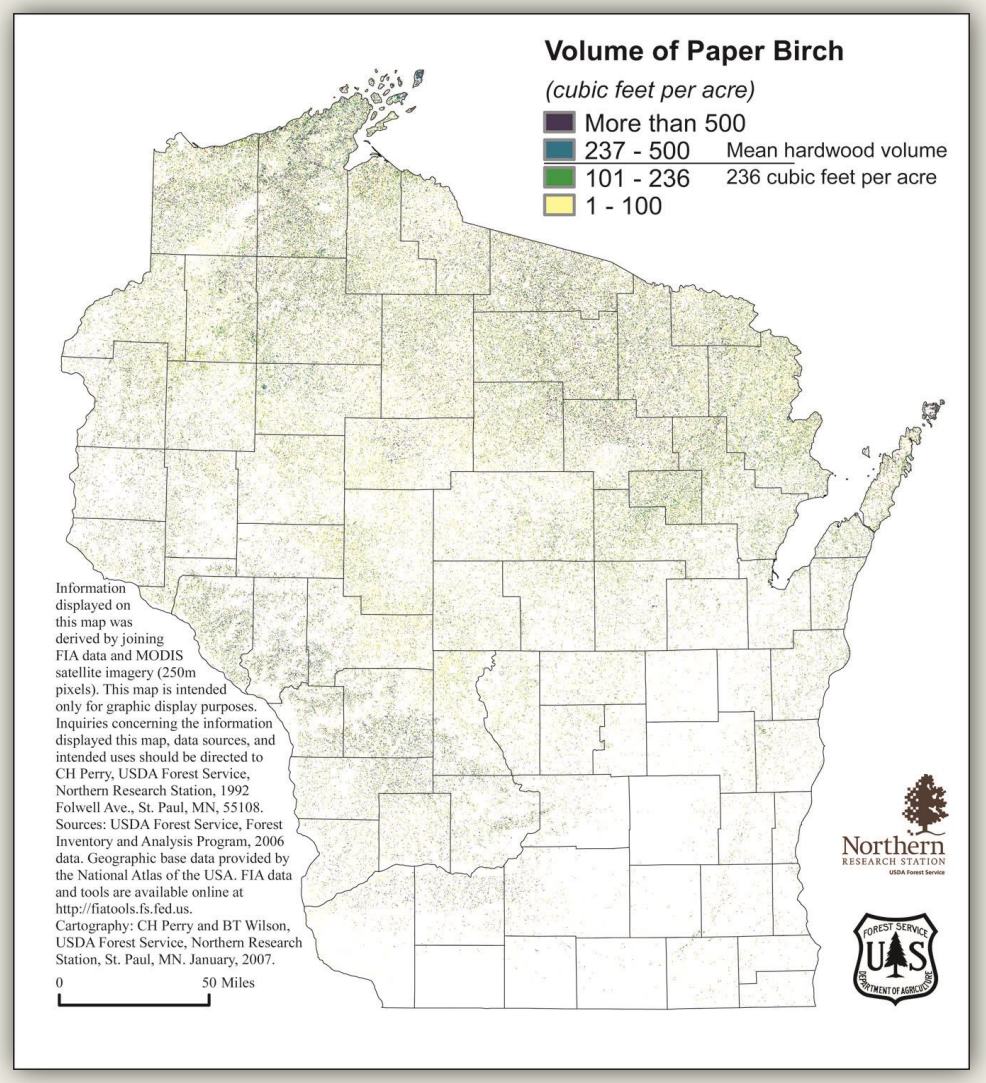


Chart 3. Percentage change in the number of live trees by size class between 1996 and 2012.
Source: USDA Forest Inventory and Analysis data: 1996 and 2012.

"Where does paper birch grow in Wisconsin?"

Growing stock volume by region with map



The largest volume of paper birch, 70%, is located in northern Wisconsin with lesser amounts in the southwest and central parts of the state.

Most paper birch is part of the aspen / birch forest type and, to a lesser extent, the maple / basswood type. In southern and central Wisconsin, it's also a part of the oak / hickory forest type.

Table 1. Growing stock volume (million cft) by species and region of the state (2012).

Species	Central	North east	North west	South east	South west	Total
Paper Birch	61	165	209	33	72	**540**
Percent of total	**11%**	**31%**	**39%**	**6%**	**13%**	**100%**

Source: USDA Forest Service, Forest Inventory and Analysis 2012 data

For a table on **Volume by County for 2012** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/VolumeCountySpecies.pdf

"How fast is paper birch growing?"

Average annual net growth by region and year

The average annual net growth of paper birch (Chart 4) has been negative since 1996, indicating that mortality exceeded growth during this period. Growth decreased by 78% between 1983 and 1996.

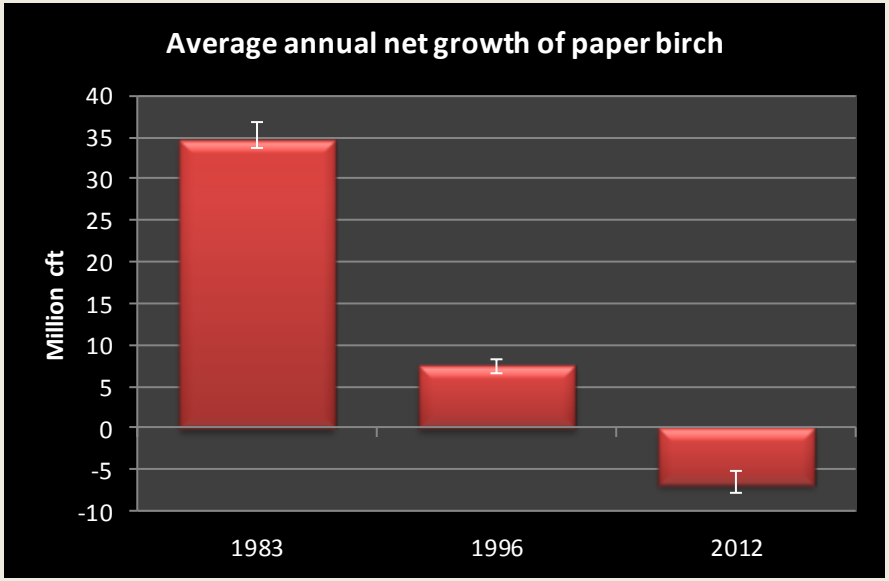


Chart 4. Average annual net growth (million cubic feet).
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2012

Table 2. Average annual net growth (million cft/year) of growing stock and the ratio of growth to volume by region of the state

Region	Net growth	Ratio of growth to volume
Central	-0.3	**-0.5%**
Northeast	-0.1	**-0.1%**
Northwest	-3.4	**-1.7%**
Southeast	-0.7	**-2.2%**
Southwest	-2.2	**-3.0%**
Statewide	**-6.8**	**-1.3%**

Source: USDA Forest Inventory and Analysis 2012

Growth rates for paper birch are negative throughout the state meaning that mortality exceeded growth between 2008 and 2012 (Table 2). The statewide ratio of growth to volume for all species is 2.6%, much higher than the negative growth rate of paper birch.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How healthy is paper birch in Wisconsin?"

Average annual mortality: 1983, 1996, and 2012

Average annual mortality of paper birch, about 22.4 million cft per year, has increased over fivefold since 1983 (Chart 5) but has changed little since 1996 (this difference may not be statistically significant due to sampling error).

The ratio of mortality to gross growth is 76.8% for paper birch, much higher than the statewide average of 28.8% and second only to elm (Table 3). Whereas paper birch accounts for 2.5% of total growing stock volume in the state, this species makes up over 9.5% of total mortality.

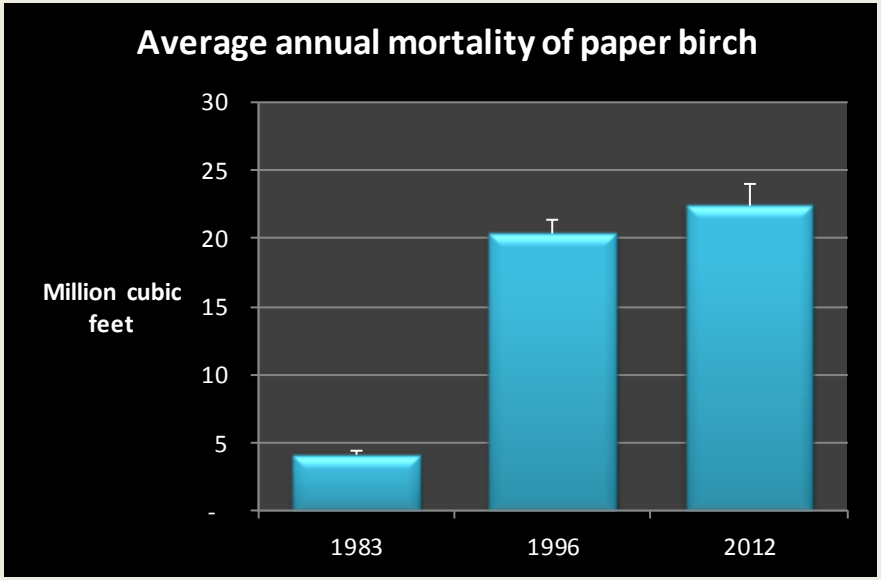


Chart 5. Average annual mortality (million cubic feet) by inventory year.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2012

Table 3. Mortality, gross growth , and the ratio of mortality to gross growth.

Species	Average annual mortality (cft)	Average annual gross growth (cft)	Mortality / growth
Paper Birch	22,374,223	29,140,362	**76.8%**

Source: USDA Forest Inventory & Analysis data: 2012

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much paper birch do we harvest?"

Roundwood production by product and year

In 2009, paper birch accounted for 23 million cft or 6.3% of Wisconsin's total roundwood production (Chart 6). About 70% of this was used for pulpwood. Birch pulpwood accounts for almost 10% of total production.

Between 2003 and 2009, paper birch roundwood production fell 20% and pulpwood alone fell 27%.

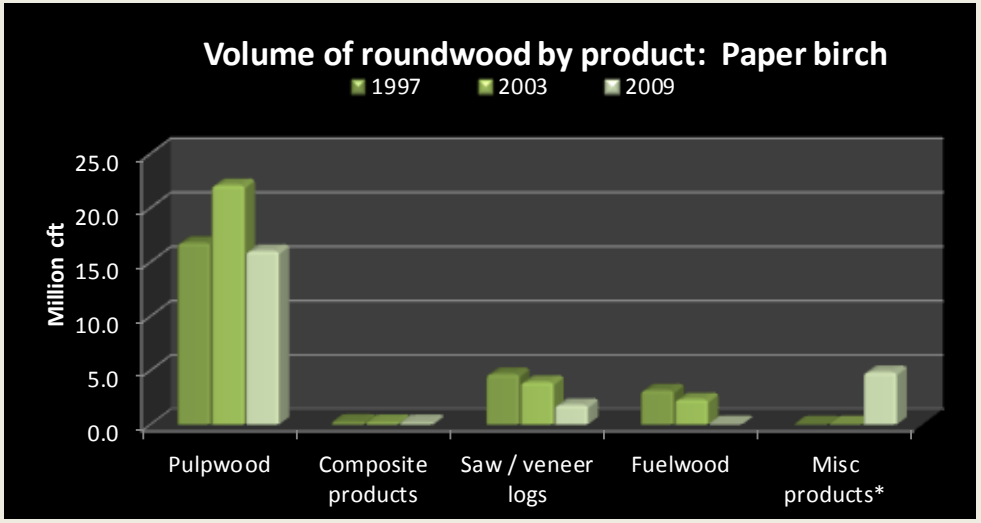


Chart 6. Volume of roundwood products. * Miscellaneous products include poles, posts, and pilings.
Source: Ronald Piva, USDA Forest Service, Northern Research Station, St. Paul MN

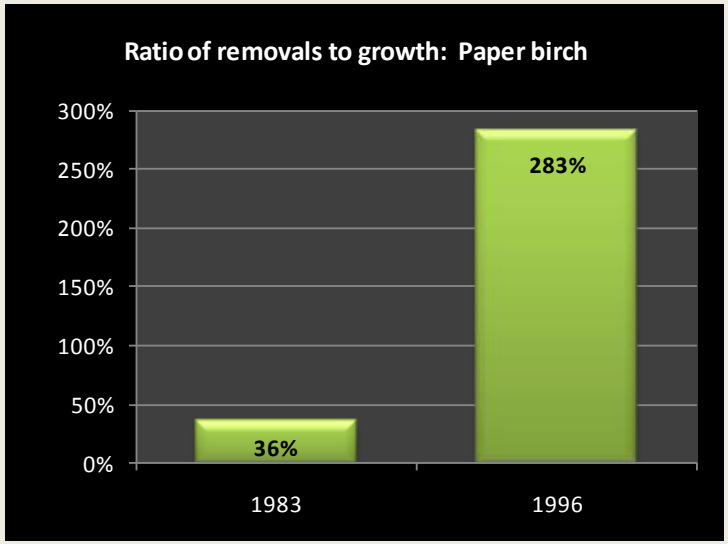


Chart 7. Ratio of volume harvested annually to net growth (2004 to 2012). The ratio for 2012 is not shown as growth was negative.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2012

The ratio of removals to growth tripled between 1983 and 1996 (Chart 7) as growth decreased and removals increased. Since 1996, mortality has exceeded growth, i.e. net growth is negative and therefore the ratio is not shown in the chart. Removals were 12.6 million cft/year and net growth was -6.8 million cft/year in 2012.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much is paper birch selling for?"

Prices for cordwood & sawtimber: 2000 to present

Due to the variability of timber prices from year to year and region to region, two methods of reporting prices are presented here: Timber Mart North (Chart 8) and the weighted average stumpage prices from Wisconsin Administrative Code Chapter NR 46 (Table 4).

Both reporting methods indicate that pulpwood prices have generally decreased from a high in 2004-2006 but are about average for all hardwoods. The average weighted value for logs has been more variable and is lower than the statewide average for hardwoods in 2012.

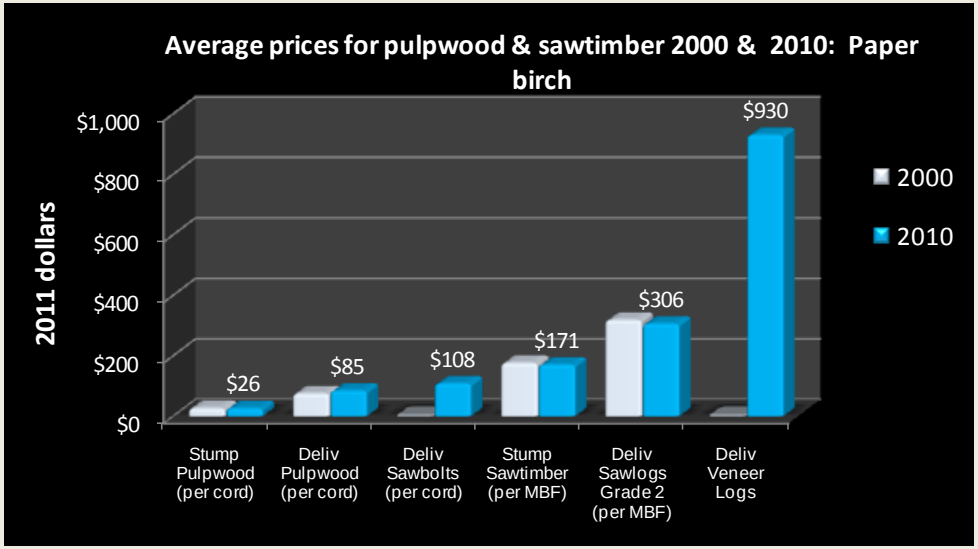
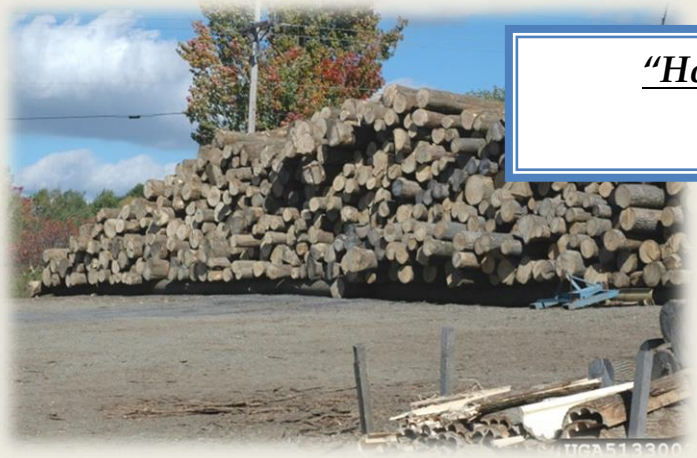


Chart 8. Average prices for cordwood and sawtimber (2008).
Source: Timber Mart North, George Banzhaf & Company, 8301 N. Allen Lane, Milwaukee, WI 53217

Table 4. Average weighted stumpage prices (adjusted for inflation to 2012 dollars) by year for Wisconsin.

Product	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	Average for all hardwoods
Cordwood (per cord)	$28	$28	$35	$52	$33	$28	$20	$23	$23	**$21**	$19
Logs (per MBF)	$215	$161	$239	$208	$156	$192	$109	$121	$122	**$131**	$148

Source: Wisconsin Administrative Code Chapter NR46, 2002 to 2012. The stumpage values calculated each year are for the sole purpose of assessing MFL yield and FCL severance taxes, not for determining the price that should be received for timber.



"How much paper birch biomass do we have?"

Aboveground carbon by region of the state

There were 17.4 million tons of aboveground biomass in live paper birch trees in 2012, a decrease of 49% from 1983. This is equivalent to approximately 9 million tons of carbon and represents 2.8% of all biomass statewide. As with volume, most paper birch is located in northern Wisconsin (Chart 9).

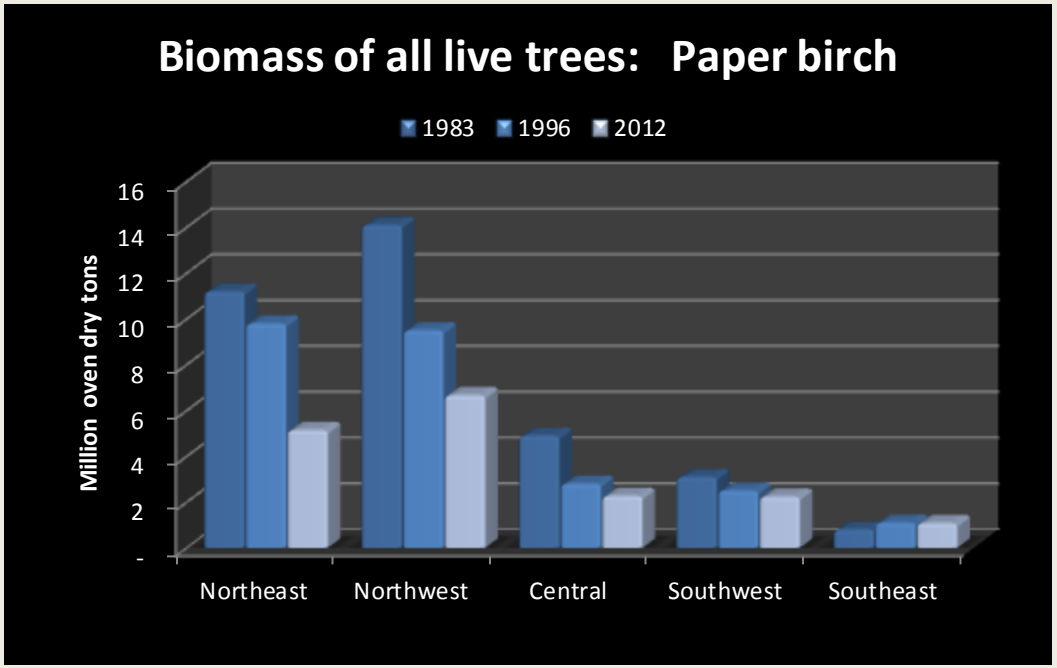


Chart 9. Biomass (above ground dry weight of live trees >1 in dbh, short tons) by year and region of the state.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2012

Paper birch is about average density for hardwoods, with a ratio of biomass to volume of 50.2 oven-dry lbs. per cubic foot (ODP/cft). The average for all trees is about 46.8 ODP/cft and for hardwoods, 50.1 ODP/cft. Approximately, 72% of all biomass is located in the main stem and 19.5% in the branches.

For a table of **Biomass by County for 2012** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/BiomassByCounty.pdf